UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/506,691	09/03/2004	Rogeli Ferrer	0595-1037	4703

466 7590 12/23/2005

YOUNG & THOMPSON
745 SOUTH 23RD STREET
2ND FLOOR
ARLINGTON, VA 22202

EXAMINER	
MOFFAT, JONATHAN	
ART UNIT	**PAPER NUMBER**
2863	

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/506,691	FERRER, ROGELI	
	Examiner	**Art Unit**	
	Jonathan Moffat	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 September 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's amendment, filed 12/6/2005, are accepted and appreciated by the examiner. All previous objections to the claims are withdrawn by the examiner.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-16 and 20, are rejected under 35 U.S.C. 103(a) as being obvious over Harrison in view of Bechhoefer (US pat 6,567,757).

With respect to claim 1,Harrison discloses a method comprising:

1) In a preliminary step, using a second reference aircraft of a type corresponding to the first rotary wing aircraft, and having its rotor without defect and adjusted to a reference setting for which the vibration level of at least one portion of said reference aircraft is at a minimum, the following operations are performed:

a) Taking at least a first series of measurements on said reference aircraft, by measuring, during particular operation of said reference aircraft, the values of at least two accelerations which are measured at arbitrary locations of said portion of the reference aircraft and which are representative of the vibration generated at said portion of the reference aircraft (Fig 15).

i) Firstly using the rotor of the reference aircraft which is without defect and which is adjusted on said reference setting (column 10 line 66- column 11 line 5).

ii) Secondly by introducing defects into said rotor (column 10 line 66- column 11 line 5).

b) On the basis of said first series of acceleration measurements and assuming that the reference aircraft is a deformable body, determining a neural network that illustrates the relationships between said accelerations and at least said introduced defects in said reference aircraft (Fig 1 items 32, 34, 52).

2) In a later step, for at least detecting any defects of the rotor of the first rotary wing aircraft, the following operations are performed on the first rotary wing aircraft:

a) Taking a second series of measurements are taken on said first rotary wing aircraft by measuring the values of at least some of said accelerations at said portion of the first rotary wing aircraft during particular operation of said first rotary wing aircraft (Fig 16).

b) On the basis of said second series of acceleration measurements and on the basis of the neural network determined in step 1/b), detecting any defects of said rotor in the first rotary wing aircraft (Fig 16).

With respect to claim 2, Harrison discloses a method comprising:

1) In the preliminary step, the following operations are performed:

b) On the basis of said first series of acceleration measurements, determining said neural network which illustrates the relationships between firstly said accelerations and secondly said defects and said adjustment parameters (Fig 15).

With respect to claim 3, Harrison discloses between steps II/b and II/c eliminating any defects that have been detected in step II/b and by taking a new, second set of measurements for use in step II/c for determining the adjustment parameters (Fig 17 and column 11 lines 44-51).

With respect to claim 10, Harrison teaches the assumption that the vibration level existing at any particular point of the aircraft corresponds to the sum of the elementary vibrations generated at said particular point and caused by the defects and the miss-adjustment of said adjustment parameters (column 7 lines 21-25).

With respect to claim 11, Harrison discloses that during step II/b, the defects that are detected are displayed (Fig 1 item 40 and column 11 lines 52-60).

With respect to claim 12, Harrison discloses during step II/b, the defects that are detected are recorded (Fig 1 item 32).

With respect to claim 13, Harrison discloses finding required adjustments.

With respect to claim 14, Harrison discloses during step II/c; the adjustment values that have been determined are displayed (Fig 1 item 40 and column 11 lines 52-60).

With respect to claim 15, Harrison discloses during step II/c, the adjustment values that have been determined are recorded (Fig 1 item 32).

With respect to claim 16, Harrison discloses:

1) Taking a third series of measurements while causing the adjustment values of only some of said adjustment parameters to vary (column 11 lines 44-51).

2) Adjusting said neural network on the basis of said third series of measurements, for the corresponding relationships which relate to the adjustment parameters for which the adjustment values have been varied (Fig 17).

With respect to claim 20, Harrison discloses a method comprising:

1) Providing corresponding aircraft having reference setting for which vibration reference aircraft is at a minimum; second reference aircraft of a type to the first rotary wing aircraft, the reference rotor without defects and being adjusted to portion (Fig 15).

2) Taking a first series of measurements on the reference aircraft by measuring plural accelerations at the portion of the reference aircraft which are representative of the vibration at the portion measurements the reference aircraft, being taken before and after of the reference aircraft; introducing defects first series into the rotor ((column 10 line 66- column 11 line 5).

3) On the basis of the first series of measurements and assuming that the reference aircraft is a deformable body, determining a neural network that illustrates the relationships between the plural accelerations and the defects introduced the rotor of the reference aircraft (Fig 1 items 32, 34, 52).

4) Taking a second series of measurements the first rotary wing aircraft by measuring accelerations at a portion of the first rotary wing aircraft corresponding to the portion of the reference aircraft (Fig 16).

5) On the basis of the second series of measurements and neural network, detecting defects in the rotor of the first rotary wing aircraft (Fig 16).

With respect to claim 1, Harrison fails to disclose using his method on, specifically, a rotary wing aircraft.

With respect to claim 2, Harrison fails to disclose additionally varying adjustment values during said reference aircraft step. Harrison further fails to disclose determining adjustment values to minimize rotation.

With respect to claim 4, Harrison fails to teach specific adjustment elements and parameters.

With respect to claim 5, Harrison fails to disclose specific reference flight patterns while training the neural network.

With respect to claim 6, Harrison fails to disclose specific test flights.

With respect to claim 7, Harrison fails to disclose locating acceleration sensors on the cabin of a reference aircraft.

With respect to claim 8, Harrison fails to disclose locating acceleration sensors on the tail boom of the aircraft.

With respect to claim 9, Harrison fails to disclose measurements being taken while the reference aircraft is on the ground.

With respect to claim 10, Harrison fails to teach assuming non-isotropic rotors, and non-linear relationships between adjustment parameters and acceleration values.

With respect to claim 13, Harrison fails to disclose minimizing a specific expression.

With respect to claim 20, Harrison fails to disclose using his method on, specifically, a rotary wing aircraft.

Bechhoefer teaches with respect to claims 1 and 20, vibration analysis to detect defects of a rotary wing aircraft (Figs 1 and 4).

It would have been obvious to one of ordinary skill in the art to use the method of Harrison on a rotary wing aircraft as does Bechhoefer, in order to predict early failure and prevent catastrophic failure (Harrison column 1 lines 11-18).

Bechhoefer teaches, with respect to claim 2, the steps of:

a) Taking said first series of measurements on said reference aircraft in a situation γ in addition to said situations α and β, by measuring, during the particular operation of said reference aircraft, the values of said accelerations which are representative of vibration generated at said portion of the reference aircraft and varying the adjustment values of a plurality of adjustment parameters of said rotor in said situation γ (column 2 lines 54-56).

c) On the basis of said second series of acceleration measurements and of the neural network determined in step 1/b), determining the adjustment values of at least some of said adjustment parameters which enable the level of vibration of said portion of the first rotary wing aircraft to be minimized (column 2 lines 37-51).

d) Applying to the rotor of said aircraft the adjustment values as determined in this way for said adjustment parameters (column 2 lines 37-51).

It would have been obvious to one of ordinary skill in the art to include adjustment parameters as variables in the vibration data neural network training method of Harrison as taught by Bechhoefer. This would allow operators to examine the effects of corrective methods on the blades in order to prevent catastrophic failure.

Bechhoefer teaches, with respect to claim 4, that the adjustment elements defining said adjustment parameters comprise at least the following elements of the rotor of the reference aircraft:

1) At least one balance weight for each of the blades of the rotor (column 2 lines 54-56).

2) A pitch-link on each of the blades of the rotor, except for one blade, which represents a reference blade (column 8 lines 34-38).

3) At least one compensating tab on the trailing edge of each of the blades of the rotor (column 8 lines 26-29).

It would have been obvious to one of ordinary skill in the art to use the adjustment devices of Bechhoefer in the method of Harrison in order to evaluate all possible calibration solutions to a vibration problem in order to best assess how to repair it.

Bechhoefer teaches, with respect to claim 5, that said first series of measurements are taken during at least one of the following test flights:

1) A reference flight with the rotor adjusted in accordance with said reference setting (column 8 lines 38-49).

2) Flights with defects of the rotor (column 8 lines 38-49).

3) A flight with a particular miss-adjustment of at least one balance weight of a blade (column 8 lines 38-49).

4) A flight with a particular miss-adjustment of at least one pitch-link of a blade (column 8 lines 34-38).

5) A flight with a particular miss-adjustment of at least one compensating tab provided on the trailing edge of a blade (column 8 lines 26-29).

It would have been obvious to one of ordinary skill in the art to perform the neural network forming method of Harrison while making the adjustments prescribed by Bechhoefer in order to evaluate all possible calibration solutions to a vibration problem to best assess how to remedy vibrations and to assess which flight situations incur the worst vibrations.

Bechhoefer teaches, with respect to claim 6, said measurement flights during step 11/a) includes the following configurations, during which measurements are taken:

1) A stationary flight configuration (column 8 line 2).

2) A configuration of flight at about 50 m/s (column 8 line 3).

3) A configuration of flight at continuous maximum power (column 7 lines 64-67).

4) A test on the ground with the rotor revolving (column 8 line 2).

It would have been obvious to one of ordinary skill in the art to perform the neural network forming method of Harrison while in various flight configurations as prescribed by Bechhoefer in order to best assess which flight situations incur the worst vibrations.

Bechhoefer teaches, with respect to claim 7, that for an advance and lift rotor of a reference aircraft, said portion of the reference aircraft where the values of said accelerations are measured is the cabin of the reference aircraft (column 5 lines 33-35 and Fig 4).

It would have been obvious to one of ordinary skill in the art to locate the acceleration sensors on the cabin as does Bechhoefer in the system of Harrison in order to determine the vibration present in the portion of the aircraft where pilots and sensitive equipment are located since these are elements sensitive to such vibration.

Bechhoefer teaches, with respect to claim 8, that for an anti-torque tail rotor of a reference aircraft, said portion of the reference aircraft at which the values of said accelerations are measured is the tail boom of the reference aircraft (column 5 lines 44-56).

It would have been obvious to one of ordinary skill in the art to locate sensors on the aircraft as does Bechhoefer in the method of Harrison in order to assess vibrations at various locations in order to determine a best adjustment remedy for the vibrations.

Bechhoefer teaches, with respect to claim 9, at least one of said first and second series of measurements is taken with the reference aircraft on the ground and with the tail rotor in operation (column 8 line 2).

It would have been obvious to one of ordinary skill in the art to perform the neural network forming method of Harrison while in various flight configurations as prescribed by Bechhoefer in order to best assess which flight situations incur the worst vibrations.

Bechhoefer teaches, with respect to claim 10, the assumption that:

1) The rotor is not isotropic (Figs 2 and 3).

2) The relationships between firstly the defects and the adjustment parameters and secondly the acceleration values are non-linear (column 8 lines 29-33).

It would have been obvious to one of ordinary skill in the art to make the assumptions of Bechhoefer in the method of Harrison. It is well known that rotors are not uniform enough in shape to vibrate isotropically. It is equally well known that the shape of an aircraft and the complexity of its structure make linear analysis of vibrations impractical. It would have been obvious to assume these factors in order to create a more accurate neural network.

Bechhoefer teaches, with respect to claim 13, the adjustment value of an adjustment parameter is determined by minimizing the expression $\|R(\alpha) + \gamma\|^2$ (column 3, first paragraph).

It would have been obvious to one of ordinary skill in the art to use the minimization method of Bechhoefer in the neural network of Harrison in order to determine the adjustment parameter in a simple way, allowing for smaller processor delay in the neural network.

Response to Arguments

Applicant's arguments filed 12/6/2005 have been fully considered but they are not persuasive.

The examiner respectfully disagrees that claim 3 was not addressed in the previous action. Although a typo on page 4 stating that claims 1-2 and 4-16 are rejected under USC 103(a) is conceded, a rejection of claim 3 in full appears in the body of said rejection and is maintained as a valid rejection.

With respect to applicant's argument concerning the lack of separate turbine systems in the prior art, the examiner respectfully disagrees. Applicant states that Harrison does not disclose two separate rotors and using a reference turbine to train the neural net before using the actual turbine in question. Harrison does in fact disclose training the system on a separate reference turbine of the same sort as the turbine to be modified (column 3 lines 50-60).

With respect to applicant's argument concerning the lack of introduced defects in the prior art, the examiner respectfully disagrees. Harrison discloses collecting data from reference turbines known to be failing or have defect in order to train the neural network as to a tolerance of acceptable variance in data (column 11 line 50- column 12 line 12).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. McCool (US pat 6,466,888) discloses a system very similar to that of the invention, not specifically limited to vibration data. Ventres (US pat 6,415,206) discloses a system very similar to that of the invention but without the neural network.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Moffat whose telephone number is (571) 272-2255. The examiner can normally be reached on Mon-Fri, from 7:00-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JM

John Barlow
Supervisory Patent Examiner
Technology Center 2800